

CLAIMS

1. A method for modifying a surface of an interlayer insulating film that is formed by applying a coating solution on a substrate to form a coating film, and sintering the coating film at a predetermined temperature, the method comprising the steps of:

heating an inside of a reaction chamber that contains a substrate to a predetermined temperature; and

modifying a surface of the interlayer insulating film by supplying an oxidizing gas into the reaction chamber.

2. The method for modifying a surface of an interlayer insulating film according to claim 1, wherein

the oxidizing gas is any one of ozone, water vapor, oxygen, or a mixed gas of hydrogen and oxygen.

3. The method for modifying a surface of an interlayer insulating film according to claim 2, wherein

the predetermined temperature is in a range of from 250°C to 600°C; and

the oxidizing gas is ozone.

4. The method for modifying a surface of an interlayer insulating film according to claim 2, wherein

the predetermined temperature is in a range of from 250°C to 600°C; and

the oxidizing gas is a mixed gas of hydrogen and oxygen.

5. The method for modifying a surface of an interlayer insulating film according to any one of claims 1 to 4, wherein

during the step of modifying a surface of the interlayer insulating film, the surface of the interlayer insulating film is modified such that a surface energy of the interlayer insulating film is at least 80 mN/m.

6. The method for modifying a surface of an interlayer insulating film according to any one of claims 1 to 5, wherein
during the step of modifying a surface of the interlayer insulating film, the surface of the interlayer insulating film is modified such that a surface contact angle of water on the surface of the interlayer insulating film is less than 40°.
7. The method for modifying a surface of an interlayer insulating film according to any one of claims 1 to 6, wherein
the interlayer insulating film is an interlayer insulating film of a low dielectric constant.
8. The method for modifying a surface of an interlayer insulating film according to claim 7, wherein
the interlayer insulating film of a low dielectric constant is formed of a coating solution including polysiloxane having an organic functional group.
9. An apparatus for modifying a surface of an interlayer insulating film that is formed by applying a coating solution on a substrate to form a coating film, and sintering the coating film at a predetermined temperature, the apparatus comprising:
a reaction chamber that contains the substrate;
a heating unit that heats an inside of the reaction chamber to a predetermined temperature;
an oxidizing gas supplying unit that supplies an oxidizing gas into the reaction chamber; and
a controller that controls the heating unit and the oxidizing gas supplying unit.
10. The apparatus for modifying a surface of an interlayer insulating film according to claim 9, wherein
the oxidizing gas is any one of ozone, water vapor, oxygen, or a mixed gas of hydrogen and oxygen.
11. The apparatus for modifying a surface of an interlayer

insulating film according to claim 10, wherein
the predetermined temperature is in a range of from
250°C to 600°C; and
the oxidizing gas is ozone.

12. The apparatus for modifying a surface of an interlayer insulating film according to claim 10, wherein
the predetermined temperature is in a range of from
250°C to 600°C; and
the oxidizing gas is a mixed gas of hydrogen and oxygen.

13. The apparatus for modifying a surface of an interlayer insulating film according to any one of claims 9 to 12, wherein
the controller controls the heating unit and the oxidizing gas supplying unit such that a surface energy of the interlayer insulating film is at least 80 mN/m.

14. The apparatus for modifying a surface of an interlayer insulating film according to any one of claims 9 to 13, wherein
the controller controls the heating unit and the oxidizing gas supplying unit such that a surface contact angle of water on the surface of the interlayer insulating film is less than 40°.

15. The apparatus for modifying a surface of an interlayer insulating film according to any one of claims 9 to 14, wherein
the interlayer insulating film is an interlayer insulating film of a low dielectric constant.

16. The apparatus for modifying a surface of an interlayer insulating film according to claim 15, wherein
the interlayer insulating film of a low dielectric constant is formed of a coating solution including polysiloxane having an organic functional group.